

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: YANG, Tsun-Neng

SERIAL NO.: 10/688,502

ART UNIT: 2815

FILED: October 17, 2003

EXAMINER: Brock II, P.E.

TITLE: LIGHT-EMITTING DEVICE WITH A CURRENT BLOCKING STRUCTURE AND
METHOD FOR MAKING THE SAME

AMENDMENT "A"

Director of the U.S. Patent
and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action of December 23, 2004, a response being due by March 23, 2005, please consider the following remarks:

REMARKS

Upon entry of the present amendments, previous Claims 1 - 17 have been canceled and new Claims 18 - 21 substituted therefor. Reconsideration of the rejections, in light of the forgoing amendments and present remarks, is respectfully requested. The present amendments have been entered for the purpose of distinguishing the present invention from the prior art.

In the Office Action, it was indicated that Claims 1, 2 and 5 were rejected under 35 U.S.C. § 102(b) as anticipated by the Kung patent. Claims 1, 3, 4 and 5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the Matsumoto publication in view of the Kung patent. Claims

6 - 17 were withdrawn from further consideration pursuant the 37 C.F.R. 1.142 (b) as being drawn to a non-elected group.

As an overview to the present reply, Applicant has amended the original claim language in the form of new Claims 18 - 21. New independent Claim 18 incorporates the limitations of previous of independent Claim 1, along with the limitations of dependent Claim 4. Dependent Claim 19 corresponds to the limitations of previous dependent Claim 2. Dependent Claim 20 corresponds to the limitations of previous dependent Claim 3. Dependent Claim 21 corresponds to the limitations of previous dependent Claim 5. Previous dependent Claims 6 - 17 have been canceled herein in view of the being drawn to a non-elected claim. Applicant reserves the right to take such other measures as he deems appropriate so as to protect the subject matter of the non-elected claims.

As an overview to the present reply, it is important to note that the independent Claim 18 includes the limitation found in previous dependent Claim 4 that "said current blocking structure has an area that is smaller than an area of said ohmic contact electrode". Applicant respectfully contends that this feature is neither shown nor suggested in the prior art combinations. The importance of such a feature was found in the original specification on page 10, paragraph [0028], as follows:

Referring to FIG. 8, after the photoresist layer 100 is stripped, a p-type ohmic contact electrode 90 is formed on the contact layer 88 and an n-type ohmic contact electrode 94 is formed on the other surface of the substrate 72 to complete the light-emitting device 70. The area of the opening 102 (the implanting region) is preferably smaller than that of the p-type ohmic contact electrode 90. For example, if the diameter of the p-type ohmic contact electrode 94 is 150 micrometers, the diameter of the opening 102 is preferably between 10 and 140 micrometers.

This produces the advantages as recited on page 10, paragraph [0029] as follows:

Since photons generated at the light-emitting layer 83 right below the p-type ohmic contact electrode 90 cannot emit out of the light-emitting device 70, the present invention implants protons into the light-emitting layer 83 right below the p-type ohmic contact electrode 90 to avoid the current flow hereinto so as to avoid the generation of photons right below the p-type ohmic contact electrode 90. On the contrary, the current will flow to the light-emitting layer 83 outside of the p-type ohmic contact electrode 90 to generate photons, which can emit out of the light-emitting device 70 to increase the external quantum efficiency.

Applicant respectfully contends that this feature and the advantages associated with such a feature are neither shown nor suggested in the prior art patents.

The prior art Kung patent discloses a light-emitting diode including the second electrode 58 and the current blocking portion 53. Importantly, the Kung patent teaches that the size of the current blocking portion 53 is preferably larger than that of the second electrode 58. As was recited in column 16, lines 31 - 44, of the Kung patent:

. . . wherein a portion 53 of the conductive oxide layer 52 that is larger than a second electrode 58 extends through the contact layer 80 to contact the upper surface 122b (FIG. 26) of a window layer 76. While the extended portion 53 of the conductive oxide layer 52 only extends to the upper surface 122b of the window layer 76, the extended portion 53 typically offers only moderate current blocking. However, in FIG. 22, the size 88 of the extended portion 53 of the conductive oxide layer 52, which is similarly used for current blocking, is preferably larger than the size 86 of the second electrode 58, such that light 91 which is generated in region 89 and near the edge of the second electrode 58 can escape through the transparent oxide layer 52 in the central peripheral region 54 (FIG. 4) outside the second electrode 58.

The fact that the current blocking portion 53 is larger than the second electrode is further illustrated in Figures 10, 22 and 24 of the Kung patent. This is not only different from the present invention, as claimed by new independent Claim 18, but also teaches away from the teaching of the present

invention. On this basis, Applicant respectfully contends that independent Claim 18 is no longer anticipated by the Kung patent.

The prior art Matsumoto publication discloses a semiconductor light-emitting device having an upper electrode 8 and a current blocker layer 10 below the upper electrode 8. In particular, the Matsumoto publication teaches that the size of the upper electrode 8 is larger than the size of the current blocking layer 10. It is also taught that the current blocking layer 10 is semi-insulated. As was stated in paragraph [0029] of the Matsumoto publication:

In this example, the current blocking layer 10 is semi-insulated instead of being n-typed.

In contrast, the Kung patent teaches that the size of the current blocking portion 53 is preferably larger than that of the second electrode 58 and the current blocking portion 53 is a conductive oxide region. This was recited in column 11, lines 43 - 50, as follows:

The second electrode 58 is preferably approximately aligned with the extended portion 53 of the conductive oxide layer 52, such that the LED structure 62 preferably provides radial symmetry for current blocking and light extraction. In alternate embodiments of the improved LED structures 62, the extended current blocking portion 53 is a conductive oxide region 53 which is formed separately from the conductive oxide layer 52.

Since the teaching of the Kung patent is contradictory to the teachings of the Matsumoto publication, Applicant respectfully contends that one having ordinary skill in the art would not be inclined to combine these teachings. Applicant respectfully contends that is only hindsight analysis with an attempted reconstruction of the claims of the present invention that would lead the Examiner to combine these references. On this basis, Applicant respectfully contends that independent Claim 18

would not be obvious over the combination of the teachings of the Kung patent with that of the Matsumoto publication.

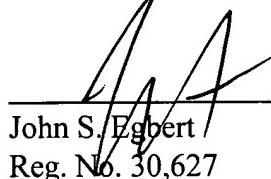
On this basis, Applicant contends that independent Claim 18 is patentably distinguishable over the prior art. Quite clearly, the prior art references would fail to show the structure, the function and the advantages achieved by the present invention, as now claimed.

Based upon the foregoing analysis, Applicant contends that independent Claim 18 is now in proper condition for allowance. Additionally, those claims which are dependent upon Claim 18 should also be in condition for allowance. Reconsideration of the rejections and allowance of the claims at an early date is earnestly solicited. Since no new claims have been added above those originally paid for, no additional fee is required.

Respectfully submitted,

3-23-05

Date


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